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UNITED STATES BUREAU OF MINES
SCOTT TURNER, DIRECTOR

INFORMATION CIRCULAR

ACCIDENT EXPERIENCE AND COST IN VIRGINIA COAL MINES 1929 TO 1933, INCLUSIVE

BY

JOSEPH F. DAVIES AND H. B. HUMPHREY

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ACCIDENT EXPERIENCE AND COST IN VIRGINIA COAL MINES 1929 TO 1933, INCLUSIVE [1]

By Joseph F. Davies[2] and H. B. Humphrey[3]

NATURE OF THIS REPORT

Along with the humanitarian need for preventing accidents the cost of injuries must be considered. As a means of bringing the facts concerning the prevalence of accidents in mining and their direct cost before the operating officials and others interested in accident prevention in the mining industry, the United States Bureau of Mines has recently made studies and published reports dealing with these subjects in several States[4]. This report gives available data on the causes and direct costs of accidents in Virginia coal mines for the 4-year period 1929 to 1932, inclusive.

Mounting compensation costs and insurance rates resulting from mine injuries indicate the necessity of measures to decrease the number and severity of accidents. These direct costs, as well as additional losses of an indirect nature, can be eliminated from the cost of production to the extent that accidents are prevented or reduced in severity.

WORKMEN'S COMPENSATION LAW OF VIRGINIA

The Virginia compensation act was passed in 1918 and amended in 1920, 1922, 1923, 1924, 1926, 1928, 1930, and 1932. It was modeled after the Indiana act; the Georgia and North Carolina acts are very similar. Employers of more than 10 persons are subject to its provisions. Exemption may be claimed by giving formal notice and accepting the legal penalties involved. Farm laborers, domestic servants, and interstate transportation companies are not covered.

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1 The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6763".

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4 See list in appendix, page 13.

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The law provides for the payment of compensation on the following schedule:

Death.- If the death results from the accident within 6 years, a weekly payment of 55 percent of the weekly wages, but not more than $14 or less than $6 a week for 300 weeks, but not over $5,000 and burial expenses not exceeding $150.

The above is to be paid to a total dependent, but if dependence is only partial compensation will be in the corresponding ratio. If no dependents are left residing in the United States or Canada compensation is limited to $1,000.

Total incapacity.- During such period as total incapacity exists, a weekly compensation equal to 55 percent of the average weekly wages of the injured, but not more than $14 or less than $6 per week, and in no case for more than 500 weeks or over $5,600.

Partial incapacity.- When the incapacity is partial a weekly compensation equal to 55 percent of the difference between the average weekly wages of the injured before the injury and those he is able to earn thereafter, but not more than $14 a week or for more than 300 weeks.

Schedule of injuries, rate, and period of compensation.- When the following injuries occur, the incapacity is deemed to continue for the number of weeks specified, and the compensation is 55 percent of the average weekly earnings.

Loss of	Period, weeks	Loss of	Period, weeks
Thumb	60	Hand	150
Index finger	35	Arm	200
Second finger	30	Foot	125
Third finger	20	Leg	175
Fourth finger	15	Eye	100
Big toe	30	Hearing of 1 ear	50
Other toe	10	Disfigurement	50
First joint, only ½ of above			

Loss of both hands, feet, or eyes or combination of any two is equivalent to total incapacity.

Waiting period.- No compensation is allowed for the first 7 calendar days of incapacity resulting from an injury, but compensation begins with the eighth day, unless such incapacity continues for more than 6 weeks, in which case it is allowed from the first day of incapacity. Before July 1930 the waiting period was 10 days.

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Medical service.- The employer must furnish such medical attention as the case requires, for not exceeding 60 days after an accident. The Industrial Commission may extend this period in particular cases, but not in excess of 180 days.

INDUSTRIAL COMMISSION AND STATISTICAL DEPARTMENT

The law is administered by the Virginia Industrial Commission, composed of three members appointed by the Governor. Under it a statistical department has been formed, with two main purposes. The first is presentation of information to employers and others interested in the field of accident prevention; the second is determination of the loss costs under the compensation law, for use in rate-making procedure. In addition, the department collects data necessary for administrative use. Reports sent out to coal-mining officials show essentially the accident situation in their companies and in relation to others in the field. Companies are designated by code letters, each company knowing its own code letter only[5]. This type of service by the statistical department has been instrumental in great improvement in the accident records of certain companies. This cooperation between State departments and corporations has been found effective in essentially every instance where it has been practiced. The statistical department receives reports from every insurance company writing compensation insurance in Virginia on every risk carried and on every injury case. These are checked with the records of the Industrial Commission and basic figures assembled for rate-making procedure.

ACKNOWLEDGMENTS

The cooperation of the Industrial Commission, particularly that of Frank P. Evans in supplying the necessary data, made this report possible. Figures on employment and certain other items were supplements by data furnished by W. W. Adams, chief statistician of the Demographical Division, United States Bureau of Mines.

ACCIDENT RECORD

For the period covered by this report (1929 to 1932) Virginia ranked eighth in the amount of coal produced each year among 24 coal-mining States. The standing of Virginia in relation to the others according to its accident record is shown in table 1. The close relation between the percentages of total production and fatalities given in this table show that normally the fatalities in the coal mines of Virginia are average in number for the amount of coal produced. Had there not been 54 deaths from explosions in Virginia the fatality record for the State in 1932 would have been much better than the average of the United States. The standing of each of these 24 States, according to fatal and nonfatal accident records for 1931, is given in table 2. For this year Virginia occupies a position slightly better than the United

5 See Appendix, page 15.

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States average in both fatal and nonfatal rates. Virginia's production is slightly less than that of Alabama and a little more than that of Colorado. Both of these States have a better fatality record than Virginia; and, although Colorado's injury rate is somewhat greater than that of Virginia, Alabama's is very much lower. No close comparisons can be drawn between any particular States on the basis of accident rates alone. Hazards may differ greatly so that a good record in one case may reflect naturally advantageous conditions and in another effective accident-prevention methods. However, where wide differences in rates appear between States producing over a million tons the reasons should be sought and corrective measures taken to save lives and reduce mining costs. Among the 16 States having a record better than the average for the United States as a whole, Alaska, Michigan, and Texas each produced less than a million tons.

Table 1. - Fatal mine-accident record of Virginia compared with that of the 24-coal mining States 1/

Year	No. of fatalities		Percentage of--		States having greater no. of fatalities	Deaths per million				States having lower frequency rate
						Man-hours		Tons		
	Va.	U. S.	Total production	Total fatalities		Va.	U. S.	Va.	U. S.	
1929	43	2,187	2.1	2.0	8	1.78	1.87	3.37	3.59	12
1930	46	2,063	2.0	2.2	8	2.43	2.06	4.22	3.84	17
1931	31	1,463	2.2	2.1	6	1.81	1.82	3.19	3.31	15
1932 2/	71	1,168	2.2	6.1	4	5.70	1.80 3/	9.20	3.29	22

1/ Bulls. 355 and 373; 1932 figures from preliminary reports of Demographical Division, U. S. Bureau of Mines.
2/ Includes 54 fatalities from gas and dust explosions.
3/ These rates are tentative.

Table 3 includes the record of mines of the companies reporting to the Industrial Commission, and the figures may differ slightly from similar data published by the United States Bureau of Mines. Figures given by the Industrial Commission include more than 98 percent of the tonnage mined in the State. The number of accidents shown differs from that given by the Bureau, since some are included by the Commission that were compensable but not regarded by the Bureau as chargeable to the industry.

The depression is evident in the decreased number of mines, tonnage produced, operating time, and men employed. Consistent reduction in accidents would have given the State a good record in 1932, had there not been 54 deaths from mine explosions. This improvement was accomplished by real cooperative effort of the officials and men of several leading companies, and State and national agencies interested in accident prevention in coal mines. The greatest factor in bringing about the improvement shown in table 3 was the very noteworthy progress made by three large companies. Their record is given in table 4 and that of the others in table 5.

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Table 2. - Relative standing of States in 1931, according to fatality and injury rates per million man-hours worked in coal mines 1/

State	Fatality rate	State	Injury rate
Michigan	-	Alaska	28.19
Alaska	-	Arkansas	51.40
Texas	0.73	Tennessee	56.99
Missouri	.96	North Dakota	57.64
Alabama	1.00	Alabama	62.10
Iowa	1.11	Kansas	64.72
Maryland	1.19	New Mexico	64.94
Kansas	1.33	Missouri	68.00
New Mexico	1.38	Kentucky	72.53
Tennessee	1.56	Maryland	78.16
Pennsylvania	1.60	Montana	79.28
Illinois	1.68	Ohio	81.11
Colorado	1.71	Virginia	81.84
Ohio	1.74	West Virginia	82.03
Kentucky	1.76	Michigan	85.80
Virginia	1.81	Colorado	95.41
United States average	1.82	United States average	99.89
Montana	1.90	Iowa	100.00
Arkansas	2.23	Pennsylvania	110.27
Oklahoma	2.33	Washington	112.74
Washington	2.38	Oklahoma	120.29
West Virginia	2.53	Wyoming	123.03
Wyoming	2.56	Indiana	129.37
Utah	3.10	Texas	140.81
North Dakota	3.26	Illinois	151.93
Indiana	3.71	Utah	153.10
Other States	10.86	Other States	14.49
United States bituminous	1.81	United States bituminous	90.57
Pennsylvania:		Pennsylvania:	
Bituminous	1.29	Bituminous	89.49
Anthracite	1.84	Anthracite	126.55

1/ From Bureau of Mines Bull. 373, Coal-Mine Accidents in the United States, 1931.

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Table 3. - Relation of accidents to operation in Virginia coal mines, 1929 - 1932

Year	Mines operating	Tons produced	Average days active	No. employed	Accidents			
					Fatal	Nonfatal compensable	Non-compensable	Total
1929	89	12,310,248	249	12,835	57	1,414	1,000	2,471
1930	87	10,884,613	200	12,397	47	1,200	752	1,999
1931	83	9,601,843	185	11,613	32	1,151	430	1,613
1932	77	7,307,172	144	10,143	75	793	235	1,103
Totals	336	40,103,876	- -	46,988	211	4,558	2,417	7,186
Average	84	10,025,777	195	11,747	53	1,140	604	1,800

Table 4. - Accident record of three large companies showing greatest improvement in accident reduction

Year	No. employed, percent of Va. total	Tons produced, percent of Va. total	Lost-time injuries		Accidents per million-	
			Number	Percent of Va. total	Tons	Man-hours
1929	45	47	1,005	40.7	172	86
1930	44	46	664	33.2	131	75
1931	43	45	444	27.6	103	59
1932	39	44	203	18.3	63	44
Total or average	43	45	2,316	32.2	127	71

Table 5. - Accident record of 40 other companies

Year	No. employed, percent of Va. total	Tons produced, percent of Va. total	Lost-time injuries		Accidents per million-	
			Number	Percent of Va. total	Tons	Man-hours
1929	55	53	1,465	59.3	225	105
1930	56	54	1,335	66.8	225	119
1931	57	55	1,169	72.4	221	118
1932	61	56	900	48.7	220	123
Total or average	57	55	4,869	67.8	223	114

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The latest available figures for the United States as a whole are given in Bureau of Mines Bulletin 373 for 1931. Based on these data, there were 1.85 lost-time injuries per million man-hours worked. In 1932 the three companies grouped in table 4 had reduced the number of their lost-time injuries per million tons to a third of those experienced in 1929 and on a man-hour basis had cut the rate in half. The remaining companies, representing approximately 55 percent of the production, showed no improvement during the period, although they include in their number a few smaller operations having good records.

It may be noted that the actual records of both groups on a man-hour basis are probably better than shown, as they were calculated on a nominally reported working shift of 8.1 hours, whereas the actual working shift was probably much longer.

Table 6. - Causes of fatal accidents in Virginia coal mines, 1929 to 1932

Cause	Number of fatalities					Rate per million-	
	1929	1930	1931	1932	Total	Tons	Man-hours
Falls of coal or slate	36	24	21	12	93	2.32	1.23
Haulage	13	19	7	5	44	1.10	.58
Explosives and explosions	4	1	1	55	61	1.52	.81
Electricity	1	0	0	2	3	.07	.04
All other	3	3	3	1	10	.25	.13
All causes	57	47	32	75	211	5.26	2.79

Table 7. - Causes of nonfatal accidents in Virginia coal mines, 1929 to 1932

Cause	Number of accidents					Rate per million-	
	1929	1930[1]	1931[1]	1932	Total	Tons	Man-hours
Falls of coal or slate	883	660	550	437	2,530	63.1	33.4
Haulage	550	510	400	188	1,648	41.1	21.7
Explosives and explosions	37	25	10	11	83	2.1	1.1
Handling objects and tools	591	442	395	227	1,655	41.2	21.8
Falls of persons	84	55	50	36	225	5.6	3.0
Electrical	21	18	11	7	57	1.4	0.8
Mechanical	58	70	59	21	208	5.2	2.8
Miscellaneous	190	172	106	101	569	14.2	7.5
All causes	2,414	1,952	1,581	1,028	6,975	173.9	92.1

[1] 1930 and 1931 segregations completed from Bureau of Mines Bulletins 355 and 373.

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CAUSES OF ACCIDENTS

The data in table 6 are taken from the reports of the industrial commission. Explosions and explosives accidents are considered in one group, as in the State industrial accident records.

The rate for the 4-year period 1929 to 1932 (1.23 fatalities per million man-hours from falls of roof and coal) and the nonfatal rate (33.4 injuries per million man-hours) are very close to the 1931 average of 1.28 and 33.2, respectively. Roof and coal falls caused 44 percent of the Virginia fatalities from 1929 to 1932, with approximately 27 nonfatal injuries to each fatality from this cause.

Fatalities from haulage accidents were 0.58 per million man-hours and nonfatal injuries 21.7; in 1931, the rates for the United States as a whole were 0.35 and 23.04. Haulage accidents caused nearly 21 percent of the fatalities for the 4-year period in Virginia, and for each fatal accident there were approximately 38 nonfatal injuries. Because of the 54 deaths from explosions in 1932 the rate from that cause is high. For the 4 years the ratio of fatal to nonfatal injuries from explosives and explosions was 1 to 1.4. Accidents from electricity were few; the fatal and nonfatal rates for the State over the 4-year period were about half the average for the country as a whole. For the 4-year period the ratio of fatal to nonfatal injuries in Virginia was 1 to 33; for the 3 years 1929 to 1931, excluding the heavy fatality record of 1932, the ratio was 1 to 44, which is probably a normal ratio for the State. The ratio for the United States for the 2 years 1930 and 1931 was 1 fatality to 52 nonfatal injuries.

ACCIDENT SEVERITY AND COSTS

Accident costs and available information on days lost are shown in table 8. The time lost on the national scale for permanent partial disabilities could not be shown because detailed information as to the exact nature of the disability was not available. The average time lost from compensable temporary injuries was 48.3 days and from noncompensable lost-time injuries 4.1 days. The average for all temporary lost-time injuries was 30.9 days. Apparently the average time lost per temporary injury varies slightly from year to year, with no particular trend. The change from 5 to 3 days lost from noncompensable injuries is based on the change from a 10-day to a 7-day waiting period in June 1930.

The cost of compensation per fatal accident in any year varies according to the average number of dependents and has ranged from $2,400.30 in 1929 to $2,988.97 in 1931. Compensation for permanent partial disabilities averaged $498.18 per case, decreasing from $534.65 in 1929 to $421.60 in 1932. This cost for 1932 may be increased by additional awards to open cases on future developments. The cost of compensation for temporary disabilities has not varied much from the average of $46.11 in any year. The average compensation per nonfatal compensable injury was $88.26.

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Table 8. - Severity and cost of accidents, 1929-32

Description	1929	1930	1931	1932	1929-32
Fatal claims:					
Number	57	47	32	75	211
Cost:					
Compensation	$141,828.00	$135,891.00	$90,847.00	$185,932.00	$554,498.00
Funeral & medical, est.	8,550.00	7,050.00	4,800.00	11,250.00	31,650.00
Total direct.	150,378.00	142,941.00	95,647.00	197,182.00	586.148.00
Ave. compensation cost.	2,400.30	2,891.30	2,988.97	2,629.09	2,627.95
Ave. medical cost, est.	150.00	150.00	150.00	150.00	150.00
Ave. total direct cost	2,550.30	3,041.30	3,138.97	2,779.09	2,777.95
Permanent total disability claims:					
Number	1	1	1	1	4
Cost:					
Compensation[1]	4,500.00	4,250.00	4,500.00	4,500.00	17,750.00
Medical[1]	250.00	250.00	250.00	250.00	1,000.00
Total direct	4,750.00	4,500.00	4,750.00	4,750.00	18,750.00
Permanent partial disability claims:					
Number	244	222	233	159	858
Days lost (actual lost time plus State award)	85,901	71,158	72,291	51,253	280,603
Ave. per case	352	321	310	322	327
Cost:					
Compensation[1]	$130,453.00	$114,562.00	$115,394.00	$67,033.00	$427,442.00
Medical, estimated	24,400.00	22,200.00	23,300.00	15,900.00	85,800.00
Total direct.	154,853.00	136,762.00	138,694.00	82,933.00	513,242.00
Ave. compensation cost	534.65	516.05	495,25	421.60	498.18
Ave. medical cost, est.	100.00	100.00	100.00	100.00	100.00
Ave. total direct cost	634.65	616.05	595.25	521.60	598.18

1/ Open cases are included. In a few cases the cost over present award is estimated.

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Table 8. - Severity and cost of accidents, 1929-32--Continued.

Description	1929	1930	1931	1932	1929-32
Temporary disability claims:					
Number	1,169	977	917	633[1]	3,696
Days lost	49,951	54,790	44,783	29,118	178,642
Ave. per case	41.9	56.2	48.8	46.0	48.3
Costs:					
Compensation	$53,455.00	$50,326.00	$39,848.00	$26,778.00	$170,407.00
Medical (est.)	46,760.00	43,965.00	36,680.00	22,155.00	149,560.00
Total direct costs	100,215.00	94,291.00	76,528.00	48,933.00	319,967.00
Ave. compensation costs	45.73	50.49	43.45	42.30	46.11
Ave. medical cost, (est.)	40.00	45.00	40.00	35.00	40.46
Ave. total direct cost	85.73	95.49	83.45	77.30	86.57
Noncompensable temporare cases:					
Number	1,000	752	430	235	2,417
Days lost	5,042	3,008	1,300	710	10,060
Ave. per case	5.0	4.0	3.0	3.0	4.1
Costs:					
Medical (est.)	$8,000.00	$6,016.00	$3,225.00	$1,762.00	$19,003.00
Ave. medical cost (est.)	8.00	8.00	7.50	7.50	7.87
Total nonfatal injuries:					
Number	2,414	1,952	1,581	1,028	6,975
Cost:					
Compensation	$188,408.00	$169,138.00	$159,742.00	$98,311.00	$615,599.00
Medical (est.)	79,410.00	72,431.00	63,455.00	40,067.00	255,363.00
Total direct	267,818.00	241,569.00	223,197.00	138,378.00	870,952.00
Ave. compensation.	78.04	86.65	101.04	95.63	88.26
Ave. medical	32.90	37.10	40.14	38.98	36.61
Ave. total direct.	110.94	123.75	141.18	134.61	124.87

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Table 8. - Severity and cost of accidents, 1929-32--Concluded.

Description	1929	1930	1931	1932	1929-32
Fatal plus nonfatal:					
Number	2,471	1,999	1,613	1,103	7,186
Cost:					
Compensation[1]/.	$330,236.00	$305,029.00	$250,589.00	$284,243.00	$1,170,097.00
Funeral and medical (est.)	87,960.00	79,481.00	68,255.00	51,317.00	287,013.00
Total direct ..	418,196.00	384,510.00	318,844.00	335,560.00	1,457,110.00
Ave. compensation cost	133.64	152.59	155.36	257.70	162.83
Ave. medical cost	35.60	39.76	42.31	46.52	39.94
Ave. total direct cost ..	169.24	192.35	197.67	304.22	202.77

1/ Open cases are included. In a few cases the cost over present award is estimated.

Total compensation costs for fatal accidents averaged $138,625 and for nonfatal accidents $153,900, making an average yearly total of $292,525. Medical costs were estimated from the available data, since several companies provide such service themselves and no figures were given. These estimated costs agree closely with those given in some similar reports on other States. (See Appendix.) The average total funeral and medical cost of all fatal and lost-time injuries per year was $71,753, or $39.94 per case. The combined total direct costs averaged $364,278 a year, or $202.77 per lost-time injury, including fatalities.

DIRECT AND INDIRECT COSTS OF ACCIDENTS

Direct accident costs considered in this report include medical, hospital, funeral, and compensation charges. The indirect costs are more intangible, but usually include the following items:

1. Time lost by injured employee.
2. Time lost by other affected employees.
3. Injury to property.
4. Loss of production.
5. Continued overhead.

The estimated costs of the indirect losses to the employer due to an accident are approximately four times the direct costs, according to H. W. Heinrich of the Travelers Insurance Co. On this basis the average indirect cost of accidents to the operator in Virginia coal mines is $1,457,110 per year and the total cost $1,821,388.

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CONCLUSION

The average direct cost of accidents in Virginia coal mines is approximately 3.6 cents per ton, and the total cost therefore would be about 18 cents. These costs are high enough to indicate plainly why accident prevention should be fostered and studied by every group connected with the industry, aside from the humanitarian obligation. This cost must come out of profit, therefore all employees, as well as the management, have a vital interest in accident reduction. Considerable reduction in accident cost and frequency can be made with little or no expense other than sincere cooperative efforts by the management and employees.

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A P P E N D I X

The following publications by the United States Bureau of Mines deal with the subject of accident costs:

The Cost of Accidents to Industry, by F. S. Crawford. Inf. Circ. 6333, 1930, 10 pp.

Accident Experience and Cost of Accidents in Washington Coal Mines, by S. H. Ash. Inf. Circ. 6529, 1931, 18 pp.

Accident Experience of the Coal Mines of Utah for the Period 1918 to 1929, by A. L. Murray and D. Harrington. Inf. Circ. 6530, 1931, 26 pp.

Accident Experience and Cost in Pennsylvania Anthracite and Bituminous Mines, 1926-30, by W. J. Fene. Inf. Circ. 6618, 1932, 29 pp.

Accident Experience and Cost in Tennessee Coal Mines, by F. E. Cash. Inf. Circ. 6664, 1932, 8 pp.

Ten Years of Fatal Accidents and Two Years of Accident Costs in Indiana Coal Mining, by C. A. Herbert. Inf. Circ. 6672, 1932, 12 pp.

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C O P Y

(State Seal)

Commonwealth of Virginia

Department of Workmen's Compensation

INDUSTRIAL COMMISSION OF VIRGINIA

Richmond

Statistical Dept.
Frank P. Evans,
Statistician.

August 1933

C O A L M I N E S

Accident frequency to tons of coal produced

January 1 to June 30, 1933

Average No. employees	Tons of coal produced	*Lost-time injuries	Tons produced per lost-time injury	
			Jan.-June 1933	Jan.-June 1932
10,122	3,824,838	425	8,999	6,426

* Industrial accidents which caused injuries resulting in loss of time from work of one day or more.

Fatal cases January 1 to June 30, 1933 5
Fatal cases January 1 to June 30, 1932 63

Average tons produced per fatal case, Jan. 1 to June 30, 1933 - 764,967

(Type of bulletins sent to operators by Statistical Dept.)

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(State Seal) Department of Workmen's Compensation

Statistical Dept.
Frank P. Evans,
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INDUSTRIAL COMMISSION OF VIRGINIA

Richmond

August 1933

COAL-MINING ACCIDENT EXPERIENCE BY COMPANIES

Tons produced per lost-time injury

Company	January 1 to June 30, 1933	1932
"A"	8,276	7,115
"B"	15,766	11,293
"C"	16,249	2,167
"D"	1,845	2,633
"E"	12,604	12,781
"F"	2,727	* 3,437
"G"	6,264	5,054
"H"	3,493	-
"I"	7,640	2,740
"J"	17,483	3,756
"K"	1,807	4,210
"L"	2,461	2,386
"M"	7,816	4,158
"N"	7,138	3,265
"O"	7,284	4,488
"P"	54,364	25,062
"Q"	8,563	8,727
"R"	6,765	5,004
"S"	5,517	2,833

Your code designation is _____

* Tons produced without a lost-time injury.

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